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RICKETTSIALPOX—A NEWLY RECOGNIZED RICKETTSIAL DISEASE [1]

I. ISOLATION OF THE ETIOLOGICAL AGENT

By ROBERT J. HUEBNER, *Senior Assistant Surgeon*, PEGGY STAMPS, *Bacteriologist*, and CHARLES ARMSTRONG, *Medical Director, United States Public Health Service*

During July 1946, a peculiar febrile disease characterized by an initial lesion and an eruption of a vesiculo-papular type was reported to the National Institute of Health. The outbreak occurred in a housing development in New York City and cooperative studies were undertaken—members of the city health department [2] and the authors participating in various phases of the work. An investigation of 80 cases during the succeeding 10 weeks disclosed a strikingly uniform clinical entity.

Because of a clinical resemblance to chickenpox and because the organism isolated from one patient has the morphological and cultural characteristics of rickettsiae, the name "rickettsialpox" is proposed. Sussman (*3*) recently reported three cases resembling those observed by us. Clinical and epidemiological features of the disease will be presented in later papers (*1*, *2*).

In the course of these etiological studies, 15 blood specimens, 1 bone-marrow specimen, 1 skin-lesion washing, and 1 lymph-node washing were inoculated into animals. An organism possessing the morphological, cultural, and staining characteristics of a rickettsia was recovered from the tissues of a single mouse, which had been inoculated with blood drawn on the second day of fever from one of the patients (M. K.).

It is the purpose of this paper to describe the isolation of the M. K. organism, and to record observations on the illness produced by it in

[1] From the Division of Infectious Diseases, National Institute of Health.

[2] Dr. Morris Greenberg, Dr. Ottavio Pellitteri.

certain laboratory animals. Antigens prepared from yolk-sac cultures of the M. K. organism and serums from 19 ill or convalescent patients were studied in the complement-fixation test. The results of this study are also presented.

ISOLATION OF THE M. K. ORGANISM

Whole blood drawn from the patient M. K. on July 26, 1946, 2 days after onset of fever was immediately placed in a dry ice container. Approximately 2 hours later the specimen was thawed rapidly and inoculated intraperitoneally into five mice and two guinea pigs. Nine days later (August 4, 1946) two of the five mice appeared ill. Inactivity, rapid breathing, and ruffled fur characterized the general appearance of both mice. Central nervous system symptoms were absent. The three other mice, which were observed for 30 days, at no time presented signs of illness. One of the sick mice became moribund and was sacrificed. The second sick mouse died during the night and was unfit for further study. Autopsy of the first mouse revealed a small amount of blood-tinged peritoneal fluid, large lymph nodes, an enlarged edematous liver, and a dark engorged spleen which was enlarged 8 to 10 times. The respiratory and intestinal tract appeared normal. The liver and spleen, the brain, and the pooled lymph nodes were suspended in saline and inoculated intraperitoneally into three groups of white mice (Swiss strain). In addition, the liver and spleen suspension was inoculated intraperitoneally into two guinea pigs.

The three suspensions used for inoculation produced objective signs of illness in each group of inoculated mice and in the two guinea pigs—the latter responding with 3 and 4 days of fever and marked scrotal reactions. The signs of disease in the mice were immobility, rapid breathing, and ruffled fur. Two of the mice in the liver and spleen passage died on the seventh day after inoculation. A second liver and spleen passage was made on the ninth day, and autopsy of the donor mouse revealed the same gross pathology as the original mouse. The liver and spleen line of passage at the time of writing is in its fourth subpassage in mice. It still produces objective illness but deaths are rare.

In the brain passage deaths did not occur, although ruffled fur and immobility were observed on the ninth day. On the twelfth day after inoculation the brain was removed from one of the mice which still appeared quite ill; a suspension was made in saline and this was inoculated into the yolk sacs of fertile eggs that had been incubated 7 days. The suspension produced no growth on blood agar. Seven days later all the embryos were moribund or dead. Films made from the yolk sacs revealed large numbers of minute intracellular and

extracellular diplobacilli staining well by Machiavello's method but poorly with methylene blue. Embryonic fluid of all the eggs produced no growth when placed on plain and blood agar.

The mice inoculated with lymph-node-passage material developed ruffled fur but no other apparent signs of illness. On the ninth day one of the mice was sacrificed, and typical post mortem findings were observed. Since there was considerable blood-tinged peritoneal fluid, this was aspirated, placed on blood agar, and inoculated into the yolk sacs of fertile eggs.

Seven days later there was no growth on the blood agar slant but all the chick embryos were dead or moribund. Again the yolk sacs showed a profuse growth of bipolar rods resembling rickettsiae. Subcultures on blood agar again were negative.

A third yolk-sac isolation of what proved to be the same organism was made from the blood of one of the two guinea pigs inoculated with the liver and spleen suspension from the original mouse. The organism was not apparent in the yolk sacs until 13 days after inoculation, suggesting a relative paucity of M. K. organisms in guinea pig blood. These three isolations from the original mouse appear to be identical. Reinoculation of yolk-sac suspensions of the M. K. organism into mice and guinea pigs results in a disease similar to that produced by animal passage material. All attempts to cultivate the M. K. organism on acellular media have failed; in addition to ordinary media, special media such as tryptose agar, Casman's blood agar, chocolate blood agar, and glucose cystine agar were employed in aerobic, anaerobic, and 20-percent carbon dioxide atmospheres.

THE M. K. ORGANISM AS A COMPLEMENT-FIXING ANTIGEN

A 10-percent suspension of first-passage yolk sacs containing many visible M. K. organisms was prepared and titrated as an antigen in the complement-fixation test [3] against convalescent serums of two patients, H. B. and J. M. Serum pools collected from guinea pigs which had recovered from endemic typhus, Rocky Mountain spotted fever, and Q fever were also employed. A portion of the 10-percent suspension was extracted with ether and the aqueous layer tested as an antigen against the same serums. The results (shown in table 1) reveal a complement-fixing reaction between the M. K. antigens and three of the serums—the Rocky Mountain spotted fever, the H. B., and the J. M. serums.

The M. K. antigen achieved its highest titer with the Rocky Mountain spotted fever serum. This is in contrast to the lower titers given against the same serums by R161, an ether-treated Rocky Mountain

[3] The Bengtson technique was used throughout.

spotted fever antigen. It should be noted that ether treatment increased the titer of the M. K. antigen in the presence of the serums of both patients.

TABLE 1.—*Titrations of crude and ether-extracted M. K. antigens against five serums in the complement-fixation test*

Antigens	Serums used in fixed dilution	Serum dilution	Results with various antigen dilutions						Results with antigen control dilutions	
			Undiluted	1:2	1:4	1:8	1:16	1:32	1:1	1:2
M. K. No. 1—10-percent crude antigen.	Endemic typhus	1:16	0	0	0	0	0	0	0	0
	Rocky Mt. spotted fever.	1:16	4	4	4	4	4	4		
	Q fever	1:16	0	0	0	0	0	0		
	H. B.[1]	1:10	4	4	1	1	0	0		
	J. M.[1]	1:10	4	4	3	2	1	0		
M. K. No. 2—10-percent ether-extracted antigen.	Endemic typhus	1:16	0	0	0	0	0	0	0	0
	Rocky Mt. spotted fever.	1:16	4	4	4	4	4	4		
	Q fever	1:16	0	0	0	0	0	0		
	H. B	1:10	4	4	4	3	1	1		
	J. M	1:10	4	4	4	4	1	(2)		
R161—30-percent ether-extracted Rocky-Mt.-spotted-fever antigen.	Endemic typhus	1:16	0	0	0	0	0	0	0	0
	Rocky Mt. spotted fever.	1:16	4	4	4	4	3	2		
	Q fever	1:16	0	0	0	0	0	0		
	H. B	1:10	4	4	4	3	1	(2)		
	J. M	1:10	4	4	4	4	1	0		
NYS—10-percent crude normal yolk-sac antigen.	Endemic typhus	1:16	0	0	0	0	0	0	0	0
	Rocky Mt. spotted fever.	1:16	0	0	0	0	0	0		
	Q fever	1:16	0	0	0	0	0	0		
	H. B	1:10	0	0	0	0	0	0		
	J. M	1:10	0	0	0	0	0	0		

[1] Serums of rickettsial pox patients taken 30 days after onset.
[2] Transient.

More potent M. K. antigens were subsequently prepared, ether extraction by method No. 1 and method No. 2 of Topping and Shepard (*4*) being the methods of choice. As with antigens prepared from *Rickettsia prowazeki*, *Rickettsia mooseri*, and *Rickettsia rickettsi*, a soluble antigen which could not be precipitated by high-speed centrifugation (4,000 r. p. m.) for 1 hour was found to be present in the M. K. antigens. Except for cross reaction with Rocky Mountain spotted fever, the antigens possessed a high degree of specificity in the complement-fixation test (table 2). Generally, the titer of human Rocky Mountain spotted fever serums has been lower when tested with the M. K. antigens than with homologous antigens.

SEROLOGICAL REACTIONS OF SERUMS FROM TYPICAL CASES, INCLUDING SERUMS FROM M. K.

Serums from patients with typical symptomatology were tested against M. K. antigens and a Rocky Mountain spotted fever antigen in the complement-fixation test. M. K. No. 2 and M. K. No. 3 as

well as R161, a Rocky Mountain spotted fever antigen, were used. Proteus OX19, and OX2 and OXK agglutinations were also done.

TABLE 2.—*Specificity of M. K. antigens in the complement-fixation test, showing the results given by the various types of serums tested to date against the M. K. antigens*

Type of serums tested	Total number of serums	Number of serums negative	Number of serums positive	Titer or range of titers of positive serums
HUMAN SERUMS				
Normal	18	17	1	1:4 (3+)
Endemic typhus	6	6	0	—
Tsutsugamushi	3	3	0	—
Q fever	6	4	2	1:4 each
Syphilis	4	4	0	—
Rocky Mountain spotted fever	11	1	10	1:8 to 1:512
Do	19	0	19	1:32 to 1:640
GUINEA PIG SERUMS				
Normal	7	7	0	—
Endemic typhus	1	1	0	—
Q fever pool	1	1	0	—
Rocky Mountain spotted fever	7	0	7	1:16 to 1:512
Do	23	0	23	1:8 to 1:512

TABLE 3.—*Complement-fixation results on serums of patients tested with M. K.*[1] *and Rocky Mountain spotted fever*[2] *antigens*

Patient	Date of onset	Date of specimens	M. K. titer	Rocky Mountain spotted fever titer
	1946	*1946*		
J. R.	Mar. 7	July 24	1:32	Negative.
Mrs. C.	Mar. 15	July 24	1:16	1:4.
Mr. C.	Mar. 29	July 24	1:256	Negative.
B. B.	June 9	July 11	Not done	1:128 (AC[3] 1:16).
		Aug. 29	1:256	1:128.
M. B.	June 23	July 11	1:32	Negative.
		Aug. 21	1:16	Negative.
C. F.	July 11	July 12	Not done	Negative.
		Sept. 13	1:64	1:16.
Mr. S.	July 7	July 26	1:32	Negative.
		Aug. 8	1:64	1:4.
M. S.	July 14	July 24	Negative	Negative.
		Aug. 18	1:256	1:64.
C. B.	July 17	Aug. 29	1:64	1:8.
L. A.	July 18	July 24	1:8	Negative.
		Aug. 18	1:128	1:128.
J. M.	July 18	Aug. 18	1:640	1:320.
A. G.	July 20	Aug. 4	1:320	1:80.
Mrs. S.	July 25	Aug. 18	1:64	1:64.
H. B.	July 27	Aug. 18	1:320	1:80.
M. K.	July 22	Aug. 29	1:512	1:256.
W. N.	July 22	Sept. 11	1:64	1:8.
M. M.	Aug. 10	Aug. 29	1:64	Negative.
A. A.	Aug. 18	Aug. 29	1:128	1:8.
		Sept. 11	1:128	1:32.
D. G.	Aug. 31	Sept. 7	1:4	Negative.
		Sept. 11	1:32	1:16.

[1] M. K. No. 2 and No. 3.
[2] R 161.
[3] Anticomplementary.

In table 3, it will first of all be noted that the serum of each patient tested reacted in the convalescent stage with the M. K. antigen, one of the highest titers being afforded by the convalescent serum of M. K. Significant but lower reactions occurred in the presence of the Rocky Mountain spotted fever antigen in 15 cases, which repre-

sent 79 percent of the total. Most significant, however, is the rise in titer against M. K. antigen shown by the serums of 4 cases, M. S., Mr. S., L. A., and D. G. Convalescent serum from a guinea pig which had shown a typical response to the M. K. mouse-liver and mouse-spleen passage was strongly positive when tested with the M. K. antigen but was completely negative in the presence of R161. Many of the convalescent serums have been tested with typhus and Q-fever yolk-sac antigens. In every instance they have been negative.

Proteus reactions were without significance in every case except two: J. M. who had a convalescent titer of 1:200 against Proteus OX19, and J. R. with a titer of 1:100 also against Proteus OX19. Since only one serum specimen was available for examination in both instances a rise in agglutinin titer was not demonstrated.

Negative results were obtained in agglutination tests for tularemia, brucellosis, leptospirosis, and the typhoid group. Heterophile agglutinations were also negative. Repeated blood cultures taken during acute stages of the disease were in every instance sterile.

BEHAVIOR OF THE M. K. ORGANISM IN THE YOLK SACS OF FERTILE EGGS AND IN CERTAIN LABORATORY ANIMALS

The M. K. organism at the time of writing has been carried through four yolk-sac passages. Yolk-sac seed materials diluted 1:10 to 1:10,000 produce death of the embryos 4 to 7 days after inoculation. Yolk-sac films stained by Machiavello's technique show red-staining diplobacillary and diplococcal forms which resemble *R. prowazeki* and *R. mooseri* in morphology. Many M. K. organisms appear on smear to be located within the nuclei of yolk-sac cells.

The staining characteristics of the M. K. organism in yolk-sac films are quite similar to those of *R. prowazeki*. Machiavello's method provides the best results, Geimsa's stain is adequate, but methylene blue and Gram's method give poor results. Apparently the organisms are decolorized by the acetone of the Gram method but take the counterstain only with indifferent success.

BEHAVIOR IN MICE

In white mice (Swiss strain) the M. K. organism has been carried through four passages of both brain and spleen suspensions. Intraperitoneal inoculation results in definite objective signs of illness, but few deaths occur. Ruffled fur is noticed as early as the sixth day after inoculation. Immobility and rapid breathing associated with no apparent interest in food and water mark the peak of the disease which is reached between the ninth and thirteenth days. Deaths may occur any time during this period. Intracerebral inoculation of infected

brain produces signs of illness earlier and results in a larger percentage of deaths than with intraperitoneal inoculation.

One cubic centimeter of heart blood taken from a sick mouse failed in one attempt to cause visible signs of illness when inoculated into the peritoneum of three fresh mice. The brain from this same mouse produced typical signs of illness when inoculated intraperitoneally into four fresh mice.

Heavily infected yolk sacs diluted 1:10 in 50-percent skim milk produced death in mice within 5 to 7 days after intraperitoneal inoculation. Less potent suspensions resulted in typical signs of illness, but death was not uniformly produced. Intravenous inoculation into mice of a potent suspension has thus far provided no evidence of a toxic substance. However, in one experiment a yolk-sac dilution as high as 1:320 was lethal within 7 days for the four mice inoculated. In lower dilutions, death occurred as early as the fourth day, and signs of illness appeared within 3 days.

Tissues of M. K. mice placed repeatedly on ordinary culture media have failed to lead to the cultivation of an organism of any significance. Occasional colonies of staphylococci and salmonella were obtained but these are occasionally encountered in work with mice at the National Institute of Health.

BEHAVIOR IN GUINEA PIGS

The M. K. organism has been maintained without difficulty through four passages in guinea pigs by means of intraperitoneal inoculation of tunica washings. Redness and swelling of the scrotum and irreducible testes, often the first signs of the disease, occur usually on the fifth day after inoculation. The onset of fever may occur anywhere from the fourth to the sixth day. A short febrile course (3 to 5 days) is marked by remissions. It is not uncommon for a guinea pig to show marked redness and swelling of the scrotum and a temperature of 40.5° C. on the fifth morning after inoculation, a normal temperature on the sixth morning, and a temperature of 40.0° C. on the seventh morning.

Temperatures taken twice daily, in the morning and in the afternoon, give a more accurate picture of the thermal reaction to the disease, often revealing a fever later in the day after a normal morning temperature has been recorded.

EFFECT IN GUINEA PIGS OF VARIOUS INOCULA

When tunica washings are used as passage material, redness and swelling of the scrotum are a constant pathological finding although

the temperature curve may often show only a single insignificant elevation.

We have been unable to reproduce signs of disease with any degree of regularity in guinea pigs when heart blood is used as passage material. On the few occasions when intraperitoneal inoculation of guinea-pig blood produced any reaction, the very mild objective signs of the disease were delayed until 10 to 15 days after inoculation.

Ten-percent yolk-sac suspensions inoculated intraperitoneally produce a more acute and severe febrile reaction. An abbreviated incubation period (1 or 2 days) is followed by a sudden onset of high fever (41° C. and higher) which is sustained without remissions for 4 or 5 days. The onset of the scrotal reaction is usually delayed until the fourth day.

Gross pathology in the infected guinea pig is characterized by: (a) periorchitis with adherence of the testes to the tunica vaginalis which is thickened and markedly injected; (b) moderately enlarged spleen and lymph nodes; (c) occasional small areas of pneumonic consolidation; and (d) frequent indurated cutaneous and subcutaneous nodules at the site of inoculation.

No systematic attempt has been made as yet to examine animal tissues for visible organisms. However, a few small red-staining diplobacilli have been seen in films made of the peritoneum and tunica vaginalis stained by Machiavello's method.

DISCUSSION

Despite the fact that only one isolation of an organism (a rickettsia) has thus far been made, the evidence presented in the foregoing account we believe to be sufficient to establish it as the causative agent of the disease under study.

Classification of the M. K. organism as a rickettsia, we believe is justified. The arthropod vector will be described in a subsequent communication.

The characteristics of the M. K. organism on yolk-sac cultivation and its behavior in guinea pigs coupled with a serologic relationship to Rocky Mountain spotted fever are suggestive of *Rickettsia conori*, the causative agent of fièvre boutonneuse.

Certain differences between the reported behavior of *R. conori* in the laboratory and the M. K. organism have, however, been observed. We have been unable to produce any signs of illness in monkeys even with large doses of potent yolk-sac suspensions (*6*). The ability to produce objective illness in white mice apparently is not shared by *R. conori*, although this point seems not to have been extensively pursued by the Mediterranean investigators.

The failure of the disease under study to stimulate agglutinins for Proteus OX19 and OX2 in the serums of most of the New York patients would seem to differentiate it in this respect from fièvre boutonneuse which is reported to produce such agglutinins regularly (*5*).

Preliminary tests (*6*) suggest a partial but incomplete cross protection of guinea pigs convalescent from infection with the M. K. organism against challenge with the Bitter Root strain of *R. rickettsi*. Complete reciprocal cross immunity has been reported (*7*) as characterizing the immunological relationship of fièvre boutonneuse and Rocky Mountain spotted fever.

SUMMARY

An organism having the morphologic and cultural characteristics of a rickettsia has been isolated from a patient during the course of an unusual outbreak of disease occurring in New York. This organism produces illness in mice and guinea pigs and grows well in the yolk sacs of fertile eggs.

Ether-extracted yolk-sac antigens have been prepared which fix complement with convalescent serums drawn from typical cases. This reaction is apparently specific insofar as it has been tested, except for cross reactions with Rocky Mountain spotted fever.

The behavior of the M. K. organism in fertile eggs, mice, and guinea pigs has been described. Certain similarities to *R. conori* have been pointed out, but further work will be necessary before any conclusion as to further similarities is possible.

ACKNOWLEDGMENTS

The aid given by Commissioner Israel Weinstein, Dr. Samuel Frant, Dr. Morris Greenberg, and Dr. Ottavio Pellitteri, of the New York City Health Department, facilitated this work immeasurably.

Dr. Ralph Muckenfuss, director, and Miss Annabel W. Walter, bacteriologist, of the New York City Bureau of Laboratories, helped with the early laboratory work in addition to providing laboratory animals, space, and equipment.

We wish also to acknowledge the cooperation offered by the physicians in charge of the patients included in this study. We are particularly grateful for the help of Dr. Benjamin Shankman and Dr. Harry N. Zeller of Kew Gardens, Dr. Leon N. Sussman of Manhattan, and Dr. Irving S. Klein, assistant medical superintendent of the Willard Parker Hospital, New York.

NOTE: Since this paper was submitted for publication, a second strain of rickettsialpox has been isolated from the blood of a patient.

M. S. The M. S. strain is culturally and immunologically indistinguishable from the M. K. strain.

More recently, a report of cases by Dr. Benjamin Shankman has appeared in the New York State Journal of Medicine (*8*).

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SKIN-SENSITIZING PROPERTIES OF DDT FOR THE GUINEA PIG[1]

By JOHN E. DUNN, *Surgeon*, ROBERT C. DUNN, *Surgeon*, and BARBARA S. SMITH, *Physiologist*, *United States Public Health Service*

INTRODUCTION

The excellent insecticidal properties of 2,2 bis(p-chlorophenyl)-1,1, 1-trichloroethane (DDT) has led to its widespread military use; with an increasing commercial supply, it will be extensively used as an agricultural and household insecticide. A great deal of laboratory work has been and is being done to determine the toxicity of this compound for various animal species; a considerable practical experience is accumulating regarding its potential danger to man. A less vital, but nevertheless important consideration involves the determination of the potential cutaneous sensitizing properties of the compound since methods of use provide ample opportunity for exposure. This report is concerned with an attempt to produce cutaneous sensitization in the guinea pig.

Despite the extensive use of DDT by the military and the intimate cutaneous exposure of large numbers of individuals in war areas, there have been no reports of proved dermatitis from this material.

[1] From the Industrial Hygiene Research Laboratory, National Institute of Health.

One report states, however, that cutaneous sensitization was induced in guinea pigs by multiple intracutaneous injections of an aqueous suspension of DDT (*1*). Several attempts to accomplish sensitization by various methods were made in this laboratory.

EXPERIMENTAL PROCEDURE

Three methods commonly used for studying cutaneous sensitization of guinea pigs to simple chemical compounds were used in an attempt to produce cutaneous sensitization to DDT. The methods involved: (1) percutaneous application (*a*) of a solution of DDT in lubricating oil and (*b*) of an acetone solution of DDT on 0.5 cm.^{2} skin area according to the method developed in this laboratory (*2*); (2) intracutaneous injection of DDT in corn oil; and (3) the intracutaneous injection of (*a*) an aqueous suspension of DDT with and without a surface active agent; (*b*) a suspension prepared by adding 0.5 cc. of a 2.5-percent solution of DDT in absolute alcohol to 99.5 cc. of physiologic saline.

Stock albino guinea pigs weighing 300 to 800 gm. were used; in a few cases, larger animals were used. Since age and sex seem to be a less important factor than individual variability in skin sensitization of guinea pigs (*3*), no attempt was made to use a group homogeneous in these respects.

The DDT used for the sensitization studies was obtained from a supply available in this laboratory which had been recrystallized from 95-percent ethanol. For percutaneous application (group 1a), a 10-percent solution was prepared in an SAE 30 machine oil; for intracutaneous injection (group 2), a 25-percent solution in corn oil was used. Since DDT crystallized out of solution at room temperature, it was necessary to warm the oil preparations in a water bath before use. Care was taken to maintain the solutions at a temperature which would not damage tissue. A 2.5-percent solution of DDT in acetone was used for the percutaneous tests (group 1b) with DDT alone on 0.5 cm.^{2} skin areas. The acqueous suspension (group 3a) was prepared by grinding DDT in a mortar, adding water to make a paste, and then gradually taking the material to volume to give a 0.1-percent suspension. To maintain the suspension, a surface active agent was added.[2] As a control, animals injected with an aqueous suspension of DDT without detergent indicated that the detergent added little, if any, to the resulting reaction. It was later found that the reactions from the injections were due to using water rather than physiologic saline as the suspending medium and not to the DDT.

The treatment procedure involved daily percutaneous application or intracutaneous injection 6 days a week, except for group (3a) which

[2] One cubic centimeter of a 10-percent solution of a laboratory detergent (Aerosol, Fischer Scientific Co.) was added to 100 cc. of suspension.

was injected every second day. The various groups were treated as follows:

Group 1a.—A group of five animals was given daily percutaneous applications of 0.05 cc. of the solution of DDT in machine oil on one flank for 14 days; a like number of control animals was treated with machine oil alone. Nine days after the last treatment each group was tested for evidence of sensitization on the opposite flank in the same manner as before.

Group 1b.—A group of 5 animals was given 18 applications of 0.005 cc. of a 2.5-percent solution of DDT in acetone on 0.5 $cm.^2$ skin areas, each at a different site on the abdomen. Ten days after the last application a test for sensitivity was applied in the same manner.

Group 2.—A group of five animals was given daily intracutaneous injections of 0.1 cc. of the DDT solution in corn oil at different sites on the abdomen for 10 days; a like number of control animals was injected with corn oil alone. Thirteen days after the last sensitization injection the two groups were injected as before to determine evidence of sensitization.

Group 3a.—A group of 10 animals, which had previously been used for poison-ivy sensitization, the majority of which had been found to sensitize easily with that material, were given injections of 0.1 cc. of the aqueous suspension of DDT with detergent every other day for 9 doses. Two other animals were injected daily 6 days a week with the same material for 14 injections; a third animal was given daily injections of DDT suspension plus detergent and of DDT suspension without detergent for 24 injections of each. Twelve days after the last injection, all animals were given a single test injection to determine sensitivity. In addition 5 control animals each received a single injection of the DDT-detergent suspension.

Group 3b.—A group of 10 animals was given a series of 18 intracutaneous injections of 0.1 cc. of the DDT suspension in physiologic saline each at a different site on one flank. Twelve days after the last of these injections, a similar injection was given in the opposite flank as a test for sensitivity.

RESULTS

The results from the different methods of treatment were as follows:

Group 1a.—There was no evidence of sensitization in the group of animals treated by percutaneous application of DDT in machine oil. Some of the animals of both the DDT-treated and control groups showed a very slight, indefinite erythema of the painted areas after several applications. After the tenth treatment the DDT-treated and control animals were mixed and then separated into two groups according to whether or not there was erythema of the treated area.

Three of the treated and two of the control animals were in the first group with erythema, and three control and two treated animals in the group without erythema. None of the DDT-treated or control animals showed any effect from the application of the sensitization test on the opposite flank at the end of the experiment.

Group 1b.—There were no reactions from any of the percutaneous tests using the acetone solution of DDT. The test for sensitivity was made with a 20-percent acetone solution; this concentration left a grossly visible coating of DDT on the test area. No reactions resulted.

Group 2.—The animals injected with the solution of DDT in corn oil and the control animals injected with plain oil all showed considerable local reaction at the site of the intracutaneous injections. This was characterized by tumefaction, more or less erythema, and often a central blanched area which frequently became necrotic and after several days sloughed away, leaving a small conical ulcer that slowly healed. The sensitization tests at the end of the experiment produced erythematous nodules in the DDT-treated animals which varied in diameter from 12 to 13 mm. at 24 hours after injection; similar lesions were produced in the controls from the oil alone varying from 10 to 12 mm. in diameter.

As a further test for sensitivity both the DDT-treated and control groups were painted on the clipped flank with 0.05 cc. of the DDT solution in machine oil and of plain machine oil, respectively. No reaction appeared in any of the animals from this treatment.

As a matter of interest and to demonstrate the presence of DDT at the sites of the intracutaneous injections and to determine possible systemic effects, the DDT-treated and control animals were killed, and the abdominal skin over the injection area and all organs were examined histologically.

At autopsy the skin showed the only significant findings. At the site of injections there were usually small papular or pustular lesions; these were seen more frequently in the DDT-treated animals and appeared in various stages of healing. A vertical section through these lesions revealed yellowish to greenish, small to medium-sized discolorations in and subjacent to the dermal lesions, diffusely in the thickened subcutaneous tissue, and focally among the muscle bundles below. Skin blocks were cut vertically through the lesions, including the adjacent tissue, laterally and below. Routine tissue blocks were taken from the liver, kidney, lungs, heart, adrenal, spleen, pancreas, and voluntary muscle. These blocks were fixed in neutral, buffered formalin. Frozen sections of liver, kidney, lung, and often skin and heart were cut and stained for lipoids by the technique of Lillie and Ashburn (*4*), substituting oil red 0.

One block of each of these tissues was embedded in paraffin, and sections were stained routinely by azure eosinate, the Prussian blue reaction, and the hemoglobin-collagen stain (*5*).

In the skin of both groups, numerous oil droplets about 5μ to 10μ in diameter were found mainly in the slightly to markedly thickened and densely cellular

fibrous tissue and granulation tissue of the hypodermis and the reticular layer of the derma. In addition, smaller extensions of a similar process were occasionally noted in the papillary layer of the derma and between the muscle bundles below the hypodermis. The oil droplets were very numerous and were usually found in the many scattered and grouped macrophages, and multinucleated, often huge, giant cells, which were mingled with a few lymphocytes, neutrophils, and eosinophils. A few to many oil-filled, round spaces, 10μ to 25μ in diameter, often marginated by oil-laden macrophages and mononuclear cells, were found in the hypodermis, most numerous next to the subjacent muscle layer, and in lesser numbers in the upper half of the hypodermis, the reticular layer of the derma, and the papillary layer of the derma. These may be lymphatic vessels of the deep and superficial cutaneous plexuses. There were also many free oil globules scattered in the derma and a few very large globules of oil scattered in the hypodermis.

A few small-to-medium-sized abscesses were found at the dermal-hypodermal junction. The largest abscesses occasionally continued upward through the derma to communicate by a crateriform tract with a relatively small, raised, ulcerated, crusted lesion in the surface epithelium. In the pus of the abscesses were a few oil globules and fragments of hair shafts. These findings were more pronounced in the DDT-treated animals than in the controls.

As a matter of histopathologic interest it may be noted that there were a few small, scattered, slightly basophilic, lipoid globules, and often on the inner wall of the lipoid-containing spaces, translucent peripheral rims of insoluble lipoid material which persisted in the paraffin sections. This material is evidently altered lipoid and appears closely related to ceroid. It is sudanophilic, faintly acid fast, and in the fluorescence microscope the material has a strong silvery fluorescence.

In the test animals a few to numerous, elongated, prismatic, bi-refringent crystals, morphologically similar to DDT crystals were noted focally in medium-sized and large globules of oil, usually in the hypodermis. A few isolated, similar crystals were seen near but not in giant cells and embedded in the abscesses.

The moderately acanthotic, vacuolated epithelium on the surface and lining the entrance to the hair follicles usually showed a slight thickening of the granular layer and slight hyperkeratosis. Hair follicles were usually sparse in the vicinity of abscesses and reaction areas.

The liver of one animal in each group showed moderate amounts of finely globular fat distributed unevenly in the hepatic cells. The spleens of three DDT-treated animals and one control showed moderate amounts of phagocytosed hemosiderin in the red pulp. There were no significant findings in the kidney, lungs, heart, adrenal, pancreas, and voluntary muscle.

In general both the DDT-treated and control guinea pigs showed the same fundamental pathologic process in the skin, manifested chiefly by the presence of fibroblastic reaction, foreign-body giant cells, macrophages, and large oil globules. This foreign-body reaction was more marked in the DDT-treated animals, presumably because of DDT crystals. There is, however, no reason to believe that this additional severity of reaction is more than may be accounted for by the physical presence of relatively insoluble crystals.

Group 3a.—The animals injected intracutaneously with the aqueous suspension of DDT containing detergent showed considerable local

reaction at each injection site similar to the effects from the oil injections but less severe. The size or intensity of the reactions did not alter appreciably during the course of the injections. From the sensitivity test, the treated animals showed reactions varying from 6 to 11 mm. in greatest diameter at 24 hours as compared with reactions of 9 to 11 mm. in greatest diameter for five control animals.

Group 3b.—There was no evidence of sensitivity in the animals injected with DDT suspended in physiologic saline. The reactions that occurred were no more than was to be expected from an intracutaneous injection and varied from evidence of the needle prick to a slight, indefinite erythema 2 to 4 mm. in diameter. The reactions from the first sensitization injections were the same as those from the test for sensitivity.

DISCUSSION

There was no evidence during these experiments to indicate that DDT is capable of inducing cutaneous hypersensitivity in the guinea pig. In a recent publication (*7*), a detailed analysis is presented identifying a long series of compounds found as contaminates in technical grade DDT. Some of these compounds are known to be capable of producing cutaneous hypersensitivity; the potentialities of others that were identified are not known. The work (*1*) published a few years ago wherein it was reported that skin hypersensitivity to DDT could be induced in guinea pigs made use of one of the first supplies of DDT available in this country. Consequently, it is possible that one or more of the contaminating compounds may have been responsible for the skin sensitivity induced rather than the DDT.

The intracutaneous injection of aqueous suspensions of water-insoluble compounds such as DDT, described elsewhere (*1*), was found to produce moderate reactions which are not seen when physiologic saline is used as the suspending medium. The reactions from water make it more difficult to evaluate reactions of cutaneous hypersensitivity using the intracutaneous-injection method.

SUMMARY

An attempt to induce cutaneous hypersensitivity to DDT in guinea pigs, using several methods, was unsuccessful.

A possible explanation is presented for the previously reported induction of cutaneous hypersensitivity to DDT in the guinea pig.

Histopathologic changes in the skin following injection of DDT in corn oil and of corn oil alone are described.

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SICKNESS ABSENTEEISM AMONG MALE AND FEMALE INDUSTRIAL WORKERS DURING 1945, WITH A NOTE ON THE RESPIRATORY EPIDEMIC OF 1945–46 [1]

By W. M. Gafafer, *Principal Statistician, United States Public Health Service*

Quarterly reports on sickness and nonindustrial injuries causing absence from work for more than 1 week among 200,000 male workers in 1945 have appeared (*1–3*), the basic data being yielded by records of sick benefit associations, group insurance plans, and company relief departments. The present paper deals with the experience of male and female workers in 1945 and earlier years. Reference is made to changes in the exposed population during the 10 years 1936–1945, to duration of absence in each of the 5 years 1941–45, and to the respiratory epidemic of 1945–46. The last report covering females appeared in 1945 (*1*).

SICKNESS ABSENTEEISM, 1936–45

Male and female frequency rates for 1945, 1944, and the 10-year period 1936–45 are given by cause in table 1. Corresponding rates for the single years 1936–42 are found in reference *4*, while rates for

[1] From the Industrial Hygiene Division, Bureau of State Services.

TABLE 1.—*Average annual number of absences per 1,000 persons on account of sickness and nonindustrial injuries disabling for 8 consecutive calendar days or longer, by cause, experience of MALE and FEMALE employees in various industries, 1945, 1944, and 1936 to 1945, inclusive* [1]

Cause. (Numbers in parentheses are disease title numbers from International List of Causes of Death, 1939)	Annual number of absences per 1,000 persons					
	Males			Females		
	1945	1936–45 [2]	1944	1945	1936–45 [2]	1944
Sickness and nonindustrial injuries	147.4	109.2	140.9	257.9	174.4	221.0
Percent of female rate	*57*	*63*	*64*			
Percent of male rate				*175*	*160*	*157*
Nonindustrial injuries (169–195)	13.2	11.8	12.1	16.4	13.4	14.5
Sickness	134.2	97.4	128.8	241.5	161.0	206.5
Respiratory diseases	55.8	43.5	57.6	110.3	72.4	85.5
Tuberculosis of respiratory system (13)	.7	.8	.7	.6	.6	.2
Influenza, grippe (33)	22.1	19.2	24.6	41.0	29.6	28.4
Bronchitis, acute and chronic (106)	9.6	6.5	9.7	11.8	8.7	11.2
Pneumonia, all forms (107–109)	5.3	4.4	6.3	2.9	2.1	2.2
Diseases of pharynx and tonsils (115b, 115c)	5.7	5.3	6.1	18.7	13.7	17.2
Other respiratory diseases (104, 105, 110–114)	12.4	7.3	10.2	35.3	17.7	26.3
Digestive diseases	20.9	15.8	19.7	35.5	26.5	36.0
Diseases of stomach except cancer (117, 118)	7.5	4.8	6.5	4.2	2.7	3.8
Diarrhea and enteritis (120)	2.7	1.7	2.8	6.7	3.4	6.1
Appendicitis (121)	3.7	4.5	4.7	13.8	13.6	16.9
Hernia (122a)	2.9	1.8	2.1	.6	.4	.8
Other digestive diseases (115a, 115d, 116, 122b–129)	4.1	3.0	3.6	10.2	6.4	8.4
Nonrespiratory-nondigestive diseases	51.9	34.9	46.1	90.0	57.4	79.6
Infectious and parasitic diseases (1–12, 14–24, 26–29, 31, 32, 34–44) [3]	3.0	2.4	2.4	6.2	3.9	4.6
Cancer, all sites (45–55)	.7	.5	.5	.4	.4	.2
Rheumatism, acute and chronic (58, 59)	6.7	4.4	6.1	4.9	3.5	5.2
Neurasthenia and the like (part of 84d)	2.8	1.4	2.4	14.3	8.1	14.0
Neuralgia, neuritis, sciatica (87b)	4.0	2.5	3.2	3.7	2.5	3.3
Other diseases of nervous system (80–85, 87, except part of 84d, and 87b)	2.2	1.4	2.0	1.8	1.1	1.4
Diseases of heart (90–95)	5.0	3.1	4.6	2.7	1.7	2.5
Diseases of arteries and high blood pressure (96–99, 102)	3.0	1.5	2.4	1.7	.9	1.4
Other diseases of circulatory system (100, 101, 103)	4.8	3.0	4.2	6.2	3.5	5.5
Nephritis, acute and chronic (130–132)	.4	.4	.5	.6	.4	.5
Other diseases of genitourinary system (133–139)	3.6	2.7	3.6	18.8	11.6	15.2
Diseases of skin (151–153)	3.9	3.1	3.6	6.1	4.0	5.2
Diseases of organs of movement except diseases of joints (156b)	4.1	3.2	3.8	6.3	2.9	5.1
All other diseases (56, 57, 60–79, 88, 89, 154, 155, 156a, 157, 162)	7.7	5.3	6.8	16.3	12.9	15.5
Ill-defined and unknown causes (200)	5.6	3.2	5.4	5.7	4.7	5.4
Average number of person-years	237,257	2,299,475	267,716	27,065	201,143	29,750

[1] Industrial injuries and venereal diseases are not included.
[2] Average of the 10 annual rates.
[3] Exclusive of influenza and grippe, respiratory tuberculosis, and venereal diseases.

1943 appear in reference *5*. The 10 annual rates for all causes, and each of the broad cause groups are shown graphically in figure 1.

All causes.—An examination of the total frequencies shown in figure 1 reveals that among both males and females the average annual number of absences per 1,000 persons on account of sickness and nonindustrial injuries disabling for 8 calendar days or longer has been increasing since 1938, culminating in male and female rates for 1945 which have not been equalled or exceeded during the 10-year period. Among males the most marked rise (30 percent) occurred from 1942 to 1943, all other annual increases being less than 10 percent. The male rate for 1945 (147.4 absences per 1,000 males) is 35

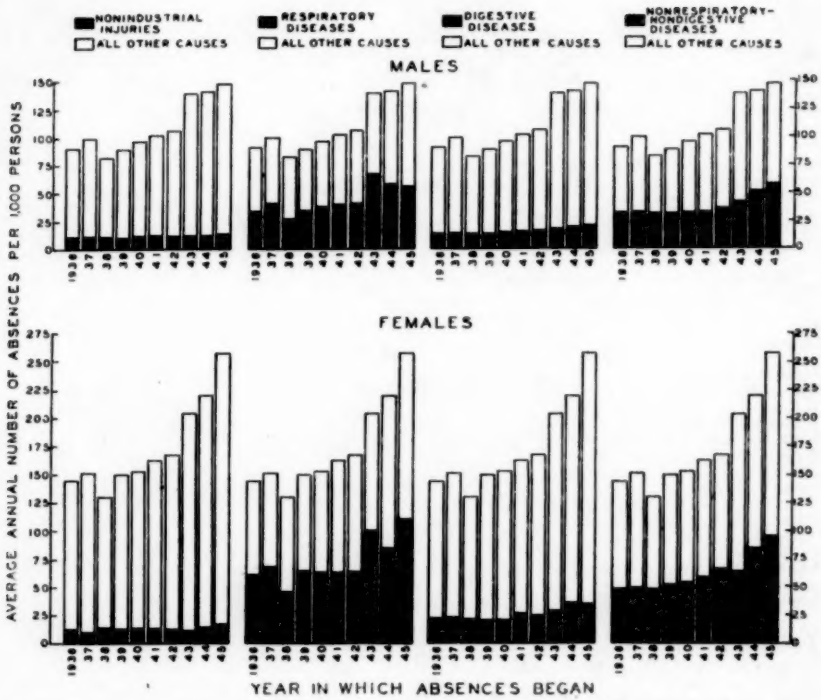

FIGURE 1.—Average annual number of absences per 1,000 persons on account of sickness and nonindustrial injuries disabling for 8 consecutive calendar days or longer, by broad cause group and year in which absences began, experience of MALE and FEMALE employees in various industries, 1936 to 1945, inclusive. (Each bar for a particular year represents the average annual frequency from all causes and the contribution made to that frequency by a particular cause group. Nonrespiratory-nondigestive diseases include ill-defined and unknown causes.)

percent above the 10-year mean (109.2), but only 5 and 7 percent, respectively, above the rates for 1944 and 1943. Among females the 1945 rate (257.9 absences per 1,000 females) is 48 percent above the mean rate for the 10 years (174.4), and 17 percent above the corresponding rate for 1944.

In each of the 10 years the frequency of all disabilities among females is higher than the corresponding rate for males, the greatest excess (75 percent) occurring in 1945.

Broad cause groups.—Figure 1 shows also the variation over the 10 years in the rates for 4 broad cause groups. Particularly striking are the 1945 rates for the group of nonrespiratory-nondigestive diseases, yielding excesses of 51 and 54 percent over the corresponding 10-year means for males and females. Attention is directed also to decreases in 1944 and 1945 in the frequency of respiratory diseases among males. Nevertheless the 1945 respiratory rate (55.8 absences per 1,000 males) is exceeded only by the rates for 1944 and 1943,

and is 28 percent above the mean respiratory rate for the 10-year period.

Specific nonrespiratory-nondigestive causes.—Because of notable excesses in the 1945 male and female rates for the nonrespiratory-nondigestive group of diseases, it is appropriate to investigate time changes in the frequency of specific nonrespiratory-nondigestive causes. Figure 2 shows graphically the contribution over the 10 years

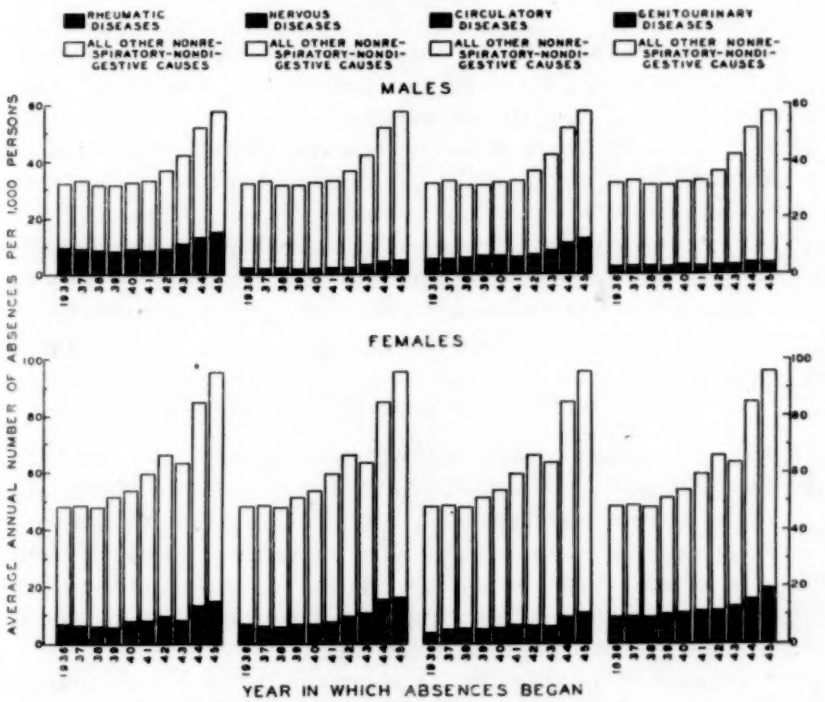

FIGURE 2.—Average annual number of absences per 1,000 persons on account of nonrespiratory-nondigestive diseases disabling for 8 consecutive calendar days or longer, by selected nonrespiratory-nondigestive cause and year in which absences began, experience of MALE and FEMALE employees in various industries, 1936 to 1945, inclusive. (Each bar for a particular year represents the average annual frequency from all nonrespiratory-nondigestive diseases, including ill-defined and unknown causes, and the contribution made to that frequency by a selected nonrespiratory-nondigestive cause.)

of the frequency of four specific nonrespiratory-nondigestive causes to the total frequency of all nonrespiratory-nondigestive diseases. These four causes, resulting each year in over half of all absences attributed to nonrespiratory-nondigestive diseases, are rheumatic diseases,[2] diseases of nervous system,[3] diseases of circulatory system, and diseases of genitourinary system.

[2] Rheumatism, acute and chronic; neuralgia, neuritis, and sciatica; and diseases of organs of movement except diseases of joints.

[3] Except neuralgia, neuritis, and sciatica.

In general, for both males and females the frequency of each nonrespiratory-nondigestive cause tends to increase over the 10 years. Among males the 1945 rates for rheumatic diseases, diseases of nervous system and diseases of circulatory system have not been equalled or exceeded throughout the 10-year period, the percentage excesses over the corresponding 10-year means being 47, 79, and 68, respectively. The 1945 rate for diseases of genitourinary system is exceeded only by the rate for 1944, and is 29 percent above the 10-year mean.

Among females the 1945 rate for each of the four specific causes is the highest recorded for the 10-year period, and is over 60 percent above the corresponding 10-year mean.

During the early years of the decade the frequency of rheumatic diseases was higher among males than among females, the sex difference tending to disappear in recent years. Throughout the 10 years the frequency of circulatory diseases remained higher among males. In each year the frequency of nervous diseases among females was about three times the corresponding rate for males, the female rate for genitourinary diseases being approximately four times the corresponding male rate.

POPULATION CHANGES, 1936–45

Observed increases in the frequency of 8-day or longer disabilities over the past decade, and particularly the persistence of relatively high rates in the years 1943–45, raise the question of associated changes in various factors possibly affecting rates. In this connection an inquiry is made into the possible relation of changes in the magnitude of the working population under study during 1936–45, and the behavior of the experienced frequency rates.

For purposes of investigation 18 companies reporting continuously throughout the 10 years were classified by industry as follows:

Industry	*Number of companies*
Group A.—Industries with marked population increases, 1936–45:	
Chemical and allied products	1
Electrical equipment	3
Iron and steel	2
Plumbing fixtures and allied products	1
Group B.—Industries with relatively slight population changes, 1936–45:	
Public utilities	3
Soap products	1
All others (printing and publishing; transportation; paper, underwear, watch manufacturing)	7

It will be noted that the industries of group A, selected on the basis of marked population increases, are more closely related to the war effort than the industries of group B showing relatively slight popula tion changes over the 10 years.

Figure 3 presents graphically for Groups A and B the 10-year variation in the average annual number of absences per 1,000 persons on account of sickness and nonindustrial injuries disabling for 8 calendar days or longer, and the average number of employees by sex and industry. Data for female employees of the iron and steel industry were not generally reported, and hence not shown in the figure.

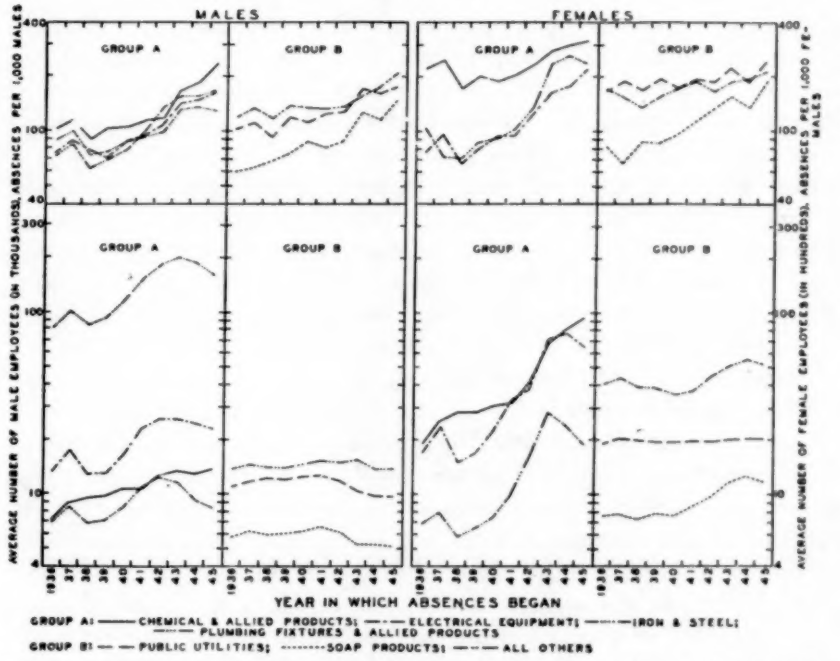

FIGURE 3.—Average annual number of absences per 1,000 persons on account of sickness and nonindustrial injuries disabling for 8 consecutive calendar days or longer, and average number of employees, by industrial group and year in which absences began, experience of MALE and FEMALE employees in various industries, 1936 to 1945, inclusive.

Figure 3 reveals a number of relationships which may be briefly summarized as follows:

(1) For each industry, regardless of group or sex, the frequency of sickness and nonindustrial injuries tends to increase over the 10-year period.

(2) In each of the four industries of group A the average number of male employees almost doubled from 1936 to 1942, only the chemical and allied products industry continuing to add to its male employees during the last 3 years. Decreases from the peak populations of 1942 and 1943 were recorded in 1944 and 1945 for male employees of the other three industries, but the frequency of disability in these industries remained relatively high. Indeed, with the exception of

the iron and steel industry, the average annual number of absences per 1,000 males in 1945 for the industries of group A had not been equalled or exceeded throughout the 10-year period.

(3) With regard to group B the average number of male employees in public utilities and the soap products industry decreased some 20 percent from 1941 to 1945, the frequency of disability in these industries increasing over 50 percent in the same period.

(4) While some increase in the average number of female employees occurred in the soap products industry and "all others" of group B, the additions appear relatively slight in comparison with the more spectacular increases in female employees recorded for the industries of group A. Nevertheless with the single exception of plumbing fixtures and allied products, the 1945 female rate for each industry in both groups A and B is the highest of the 10-year period.

Comment.—Changes in the magnitude of an exposed population are important in relation to the population's experienced sickness rates only insofar as these changes effect material differences in the composition of the group in respect of any biological or nonbiological factors influencing rates. Thus the introduction into an industrial population of large numbers of inexperienced or very young employees, of older workers, or of women is frequently accompanied by increases in the plant's sickness rates. Similarly, the removal from a population of a number of the more fit young men, such as occurs during a war emergency, may result in higher sickness rates. In both instances the composition of the population is shifted to include a larger proportion of persons more likely to be absent from work on account of disability. During periods of economic depression, on the other hand, decreases in the number of employees may reflect a decrease in employees more subject to disabling illness. Furthermore, for economic reasons the remaining employees may hesitate to be absent from work on account of sickness unless such absence is absolutely necessary. In such periods, therefore, decreases in the number of employees may be accompanied by decreases in the frequency of recorded disability.

It appears evident in the present experience that the increasing trend of sickness absenteeism in recent years was not limited to industries closely allied to the war effort in which large increases in the number of employees occurred, but was also present in a number of other industries where population changes were relatively slight.

ABSENCE DURATION, 1941–45

Data from organizations reporting duration of absence make possible the determination of the frequency of absences lasting a specified number of days or longer. These rates for all sickness and nonindustrial injuries, and for each of three board sickness groups,

are shown graphically in figure 4 by sex and year, 1941 to 1945, inclusive, minimum absence durations ranging from 8 to 92 days.

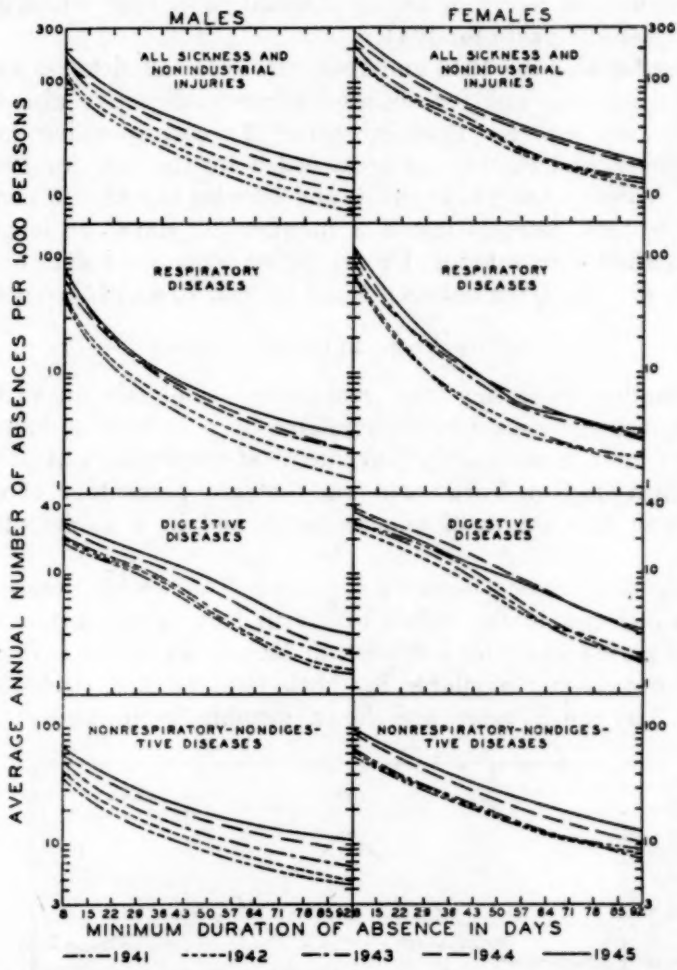

FIGURE 4.—Average annual number of ended absences per 1,000 persons on account of sickness and nonindustrial injuries disabling for the specified number of calendar days or longer, for all sickness and nonindustrial injuries and 3 broad sickness groups, experience of MALE and FEMALE employees in various industries reporting absences by duration, absences beginning in 1941 to 1945, inclusive. (Vertical logarithmic scale. Nonrespiratory-nondigestive diseases include ill-defined and unknown causes.)

The rates for a particular year indicate the ability of absences beginning in that year to continue to contribute to the frequency rate as the lower limit of duration is increased. Thus the presence of a relatively large number of absences of long duration is reflected in a relatively slow decline in the rates for a particular year.

Of striking interest in figure 4 is the ordering with time of the male rates for digestive and nonrespiratory-nondigestive diseases.

This ordering is reflected in the behavior of the curves for all sickness and nonindustrial injuries, which are similarly ordered except for the frequency of 8-day or longer disabilities in 1943 which exceeds the corresponding rate for 1944.

Among females the 1945 and 1944 curves for all sickness and nonindustrial injuries, and for nonrespiratory-nondigestive diseases, are distinct, each rate for 1944 exceeding the corresponding rates for earlier years, and in turn being exceeded by the rate for 1945.

In each year among both males and females less than 5 percent of the respiratory diseases lasted 3 months (92 days) or longer, the corresponding percentages for digestive and nonrespiratory-nondigestive diseases lying between 5 and 10, and 10 and 15, respectively.

RESPIRATORY EPIDEMIC, 1945–46

Information reflecting the respiratory epidemic prevailing in 1945–46 was generously made available by a number of companies. The data include the weekly percentage of employees out sick in a public utility in New York State, and the daily percentage of workers out sick in five plants of one company and in a public utility in Illinois.

Weekly percentage of workers out sick.—The weekly percentage of workers out sick in the public utility in New York State covers a 4-month period from the first week in November to the first week in March, data being available for both 1945–46 and 1944–45. The indexes for the 2 years are shown graphically in figure 5. The

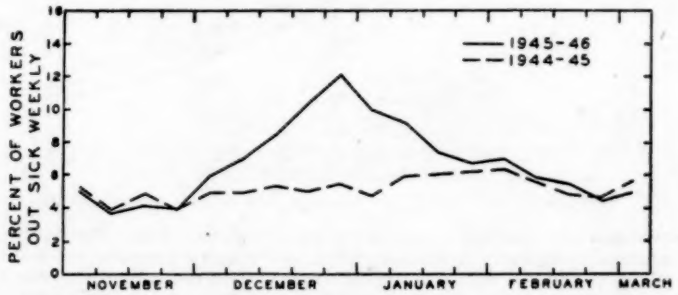

FIGURE 5.—Percentage of workers out sick weekly during specified month of 1945–46 compared with percentage out the corresponding week of 1944–45, experience of employees in a public utility (New York State).

presence of an epidemic occurring principally in December and January of 1945–46 is clearly shown in figure 5. A peak index was reached during the last week in December 1945, when the weekly percentage of workers out sick (12.1) was over twice the corresponding rate for 1944.

Average daily percentage of workers out sick.—Figure 6 presents graphically the average percentage of workers out sick daily during the specified weeks of November 1945, to January 1946. The upper part of the figure shows the variation in the index for five plants of one company located as follows: Plant A, Maryland; Plant B, New Jersey; Plant C, Indiana; Plant D, Missouri; and Plant E, Massachusetts. The lower portion of the figure compares the experience of Plant C with that of a public utility in Illinois (Plant F), the two plants being located in the same geographic region.

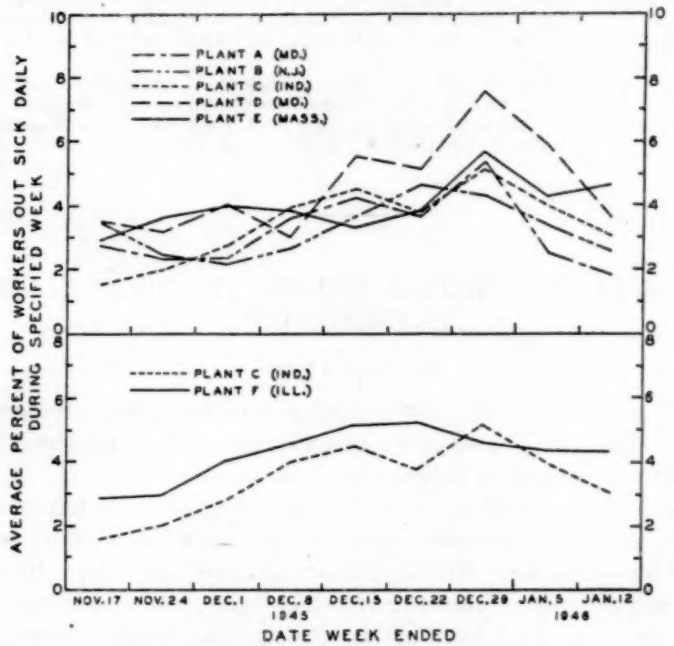

FIGURE 6.—Average percentage of workers out sick daily during specified week, November 1945, to January 1946, experience of employees (1) of five plants of a manufacturing company, and (2) of Plant C (Indiana) compared with a public utility, Plant F (Illinois).

In each of the five plants of the one company the average daily percentage of workers out sick tended to increase from November to the latter part of December, and then began to decrease. In four plants, a peak rate was reached in the week ending December 29, the average indexes ranging from 5.1 percent for Plant C to 7.6 percent for Plant D. For Plant B the maximum rate (4.6) occurred the preceding week.

The movement of the indexes for Plant C in Indiana and the public utility in Illinois, shown in the lower part of figure 6, is not dissimilar. While a peak value of the index for Plant F was reached a week earlier

than for Plant C, the maximum value of the average daily percentage of workers out sick was slightly over five.

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(5) ————: Sickness absenteeism among male and female industrial workers during 1943 and among males during the first and second quarters of 1944, with a note on the respiratory epidemic of 1943–44. Pub. Health Rep., **59:** 1267–1274 (Sept. 29, 1944). (Reprint No. 2578.)

MALARIA INFECTION ACQUIRED THROUGH BLOOD TRANSFUSION

Report of a Case

Dr. W. D. Schrack, Jr., Epidemiologist of the Pennsylvania State Department of Health, reports a case of malaria in which the infection was apparently acquired through a blood transfusion.

The patient was admitted to the hospital for an operation on March 18, 1946. A blood transfusion was given to her while on the operating table. The blood was obtained from the bospital blood bank, the donor being a returnee from the armed services. It was subsequently revealed that he had had malaria, with the latest recurrence in January. The date on which the blood was obtained from the donor was not given, but Dr. Schrack states that it is reasonable to assume that it was not many days before the date of transfusion.

The patient was discharged on April 2, with no untoward symptoms. About 3 weeks after the blood transfusion, the patient had a chill, followed by malaise, anorexia, and fever. She was rehospitalized on May 2, and a diagnosis of malaria was made. *Plasmodium vivax* was found in a blood smear. Up to June 10, *Plasmodium* had not been demonstrated in the donor's blood. The patient had always been a resident of Pennsylvania and her history gave no evidence of any previous attack of malaria.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED OCTOBER 19, 1946

Summary

A slight net decline was recorded during the week in the incidence of poliomyelitis, but increases were reported for the South Atlantic and East South Central areas. A total of 977 cases was reported, as compared with 1,042 last week, 722 for the corresponding week in 1944, and a 5-year (1941–45) median of 438. Of the 37 States reporting currently, 5 or more cases, 15 showing increases reported an aggregate of 255 cases (last week 151), while the other 22 States reported 705 (last wek 857). The 25 States reporting more than 10 cases each are as follows (last week's figures in parentheses): *Increases*—Vermont 15 (6), Ohio 32 (14), Indiana 29 (23), Michigan 71 (57), North Dakota 24 (14), South Dakota 11 (6), North Carolina 13 (3), Georgia 11 (1), Arkansas 14 (10); *decreases*—Massachusetts 29 (32), Connecticut 14 (17), New York 63 (77), New Jersey 12 (13), Illinois 99 (139), Wisconsin 61 (67), Minnesota 64 (67), Iowa 25 (39), Missouri 57 (70), Nebraska 37 (44), Kansas 70 (71), Oklahoma 16 (17), Texas 18 (21), Colorado 15 (21), Washington 33 (36), California 51 (65).

A total of 385 cases of diphtheria was reported, as compared with 341 last week, 696 for the corresponding week last year and a 5-year median of 656. While the weekly incidence was higher than for last year during the first half of the current year, it has been below since the middle of July, and the cumulative total, 12,513, has for the first time dropped below last year's corresponding figure, 12,551.

The current incidence of typhus fever, 64 cases for the week and 410 for the 5-week period from September 15 to October 19, is less than the corresponding figures of any of the past 5 years. The total for the year to date, 2,888, is less than for the corresponding period of any year since 1941.

Deaths recorded during the week in 91 large cities of the United States aggregated 8,606, as compared with 8,463 last week, 9,311 and 8,893 for the corresponding weeks of 1945 and 1944, respectively, and a 3-year (1943–45) average of 8,919. The cumulative total for the same cities for the year to date is 374,252, as compared with 370,433 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended Oct. 19, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Oct. 19, 1946	Oct. 20, 1945		Oct. 19, 1946	Oct. 20, 1945		Oct. 19, 1946	Oct. 20, 1945		Oct. 19, 1946	Oct. 20, 1945	
NEW ENGLAND												
Maine	7	0	0	-	-	-	57	-	7	1	0	0
New Hampshire	0	0	0	-	-	-	-	-	1	0	0	0
Vermont	0	3	0	-	-	-	83	-	1	0	0	0
Massachusetts	21	6	5	-	-	-	81	139	96	2	3	3
Rhode Island	0	2	2	-	9	-	8	-	-	0	0	1
Connecticut	1	0	0	-	-	1	11	18	11	0	1	2
MIDDLE ATLANTIC												
New York	22	16	15	[1] 3	[1] 2	[1] 4	111	36	80	2	13	16
New Jersey	1	1	3	2	3	3	16	13	22	1	4	4
Pennsylvania	15	8	9	1	-	1	134	139	105	4	9	9
EAST NORTH CENTRAL												
Ohio	24	17	8	-	6	6	40	8	22	5	5	5
Indiana	9	9	12	2	8	3	3	5	5	1	0	0
Illinois	6	2	7	5	5	6	12	49	17	3	5	5
Michigan [2]	5	15	12	-	2	-	23	104	35	2	4	4
Wisconsin	8	2	1	7	18	16	47	15	34	3	0	2
WEST NORTH CENTRAL												
Minnesota	6	10	10	-	-	1	-	8	10	2	1	1
Iowa	4	8	2	-	-	-	2	3	6	3	1	0
Missouri	16	5	5	3	-	-	1	5	4	3	3	3
North Dakota	0	2	1	1	2	2	1	1	1	0	0	0
South Dakota	2	4	7	-	-	-	-	2	2	0	0	0
Nebraska	5	3	0	6	-	-	4	1	4	0	0	0
Kansas	10	6	4	-	2	2	4	11	4	1	0	0
SOUTH ATLANTIC												
Delaware	0	2	2	-	-	-	3	1	-	0	0	0
Maryland [2]	5	14	6	-	3	2	7	1	5	1	1	3
District of Columbia	0	0	0	-	1	-	1	2	2	1	1	1
Virginia	23	34	33	242	161	138	8	1	4	2	0	1
West Virginia	5	14	9	1	-	5	-	-	2	2	0	1
North Carolina	13	87	83	-	-	1	12	6	6	0	1	1
South Carolina	1	38	38	38	418	272	-	18	16	0	2	2
Georgia	11	40	30	9	76	22	7	-	2	0	2	1
Florida	17	4	10	9	10	10	1	2	2	2	0	0
EAST SOUTH CENTRAL												
Kentucky	23	13	15	-	-	-	2	20	13	1	0	1
Tennessee	14	67	25	18	5	7	10	1	6	1	3	3
Alabama	15	35	29	24	15	20	4	1	3	2	2	2
Mississippi [3]	12	44	18	-	-	-	-	-	-	0	0	1
WEST SOUTH CENTRAL												
Arkansas	4	32	15	16	32	20	10	2	4	0	0	0
Louisiana	5	15	17	29	-	-	3	-	1	0	0	0
Oklahoma	1	12	12	27	73	35	3	7	4	0	0	0
Texas	32	61	58	918	1,102	664	24	23	23	4	3	3
MOUNTAIN												
Montana	2	4	2	-	1	1	5	22	4	0	0	0
Idaho	0	0	0	3	6	-	-	76	3	0	0	0
Wyoming	1	0	0	-	-	5	1	5	4	0	0	0
Colorado	6	5	8	25	8	10	5	25	11	1	1	0
New Mexico	0	2	1	1	1	1	27	-	3	1	0	0
Arizona	3	5	1	106	29	50	27	1	3	1	2	0
Utah [3]	1	1	0	6	-	2	7	6	6	1	0	0
Nevada	0	0	0	-	-	-	1	-	-	0	0	0
PACIFIC												
Washington	9	7	7	-	-	-	11	111	22	0	3	2
Oregon	1	8	1	2	2	9	18	7	15	1	0	1
California	19	33	21	6	8	18	87	181	98	8	3	5
Total	385	696	656	1,510	2,008	1,277	922	1,076	1,076	62	73	73
[4]2 weeks	12,513	12,551	11,193	200,048	80,601	89,808	644,732	107,387	548,387	[5] 5,002	6,918	6,918

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Delayed report: Arkansas, meningitis, week ended Mar. 2, 4 cases (instead of 3).

Telegraphic morbidity reports from State health officers for the week ended Oct. 19, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [4]		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1914–45
	Oct. 19, 1946	Oct. 20, 1945		Oct. 19, 1946	Oct. 20, 1945		Oct. 19, 1946	Oct. 20, 1945		Oct. 19, 1946	Oct. 20, 1945	
NEW ENGLAND												
Maine	5	2	0	15	19	19	0	0	0	0	0	0
New Hampshire	1	1	2	6	2	7	0	0	0	0	1	0
Vermont	15	2	2	8	4	4	0	0	0	0	0	0
Massachusetts	29	27	17	40	90	119	0	0	0	4	1	2
Rhode Island	6	0	1	6	5	5	0	0	0	0	0	0
Connecticut	14	16	8	27	13	22	0	0	0	1	2	0
MIDDLE ATLANTIC												
New York	63	66	55	127	174	131	0	0	0	5	9	9
New Jersey	12	43	12	29	32	46	0	0	0	1	2	2
Pennsylvania	5	37	30	106	131	114	0	0	0	6	4	9
EAST NORTH CENTRAL												
Ohio	32	23	14	143	197	156	0	0	0	4	0	10
Indiana	29	19	5	52	78	78	0	1	1	5	1	1
Illinois	99	42	20	86	97	125	0	0	0	2	2	6
Michigan [3]	71	14	11	112	108	101	1	0	0	4	0	3
Wisconsin	61	52	15	46	70	70	0	0	0	1	1	1
WEST NORTH CENTRAL												
Minnesota	64	14	11	25	39	39	0	0	0	1	1	0
Iowa	25	18	4	15	40	40	0	0	0	3	0	1
Missouri	57	17	5	17	56	56	1	0	0	8	6	3
North Dakota	24	0	1	2	11	9	0	0	0	0	2	2
South Dakota	11	0	0	5	2	10	0	0	0	1	0	0
Nebraska	37	5	3	16	7	11	0	1	0	0	0	0
Kansas	70	14	8	23	41	49	0	0	0	0	1	2
SOUTH ATLANTIC												
Delaware	2	0	0	2	4	5	0	0	0	0	3	1
Maryland [3]	5	8	7	11	45	37	0	0	0	1	1	2
District of Columbia	1	4	4	4	8	14	0	0	0	0	1	0
Virginia	5	9	6	39	106	63	0	0	0	3	3	5
West Virginia	3	3	3	86	77	77	0	0	0	2	3	3
North Carolina	13	11	10	17	95	95	0	0	0	1	1	2
South Carolina	1	3	3	1	8	11	0	0	0	1	0	1
Georgia	11	10	6	14	31	33	0	0	0	0	2	3
Florida	9	9	1	7	7	7	0	0	0	4	3	1
EAST SOUTH CENTRAL												
Kentucky	1	3	3	15	55	47	0	0	0	2	10	4
Tennessee	8	17	3	31	81	81	0	0	0	1	6	6
Alabama	7	3	2	19	24	30	0	0	0	3	6	2
Mississippi [3]	8	4	3	12	23	15	1	6	0	6	0	2
WEST SOUTH CENTRAL												
Arkansas	14	4	2	5	26	12	0	0	0	2	4	4
Louisiana	7	10	1	3	15	9	0	0	0	4	3	3
Oklahoma	16	11	2	6	15	15	0	0	0	1	0	4
Texas	18	18	13	29	119	47	0	1	0	9	13	14
MOUNTAIN												
Montana	2	7	1	2	14	12	0	0	0	0	1	0
Idaho	1	1	0	9	19	7	0	0	0	0	1	0
Wyoming	0	0	1	3	0	2	0	0	0	0	0	0
Colorado	15	3	2	14	21	22	0	0	0	1	2	3
New Mexico	4	0	0	9	12	8	0	0	0	2	0	3
Arizona	1	1	0	4	6	6	0	0	0	1	3	1
Utah [3]	5	5	1	15	10	10	0	0	0	0	0	0
Nevada	0	0	0	1	0	0	0	0	0	0	0	0
PACIFIC												
Washington	33	15	10	16	37	37	0	0	0	0	1	1
Oregon	6	1	3	13	19	18	0	0	0	0	0	1
California	51	46	19	93	187	116	0	0	0	10	3	4
Total	977	618	438	1,386	2,280	2,089	3	9	9	100	103	121
42 weeks	21,657	11,463	10,757	94,441	146,271	111,119	300	295	645	3,464	4,166	4,739

[3] Period ended earlier than Saturday.

[4] Including paratyphoid fever reported separately, as follows: Massachusetts (salmonella infection) 3; Connecticut 1; Ohio 1; **Michigan 3**; North Carolina 1; Tennessee 1; Louisiana 1; California 1.

[5] Corrected reports: Poliomyelitis, week ended Sept. 28, North Carolina, 10 cases (instead of 11); **Arkansas, 26 (instead of 25); Georgia**, week ended September 21, 3 cases (instead of 4).

Telegraphic morbidity reports from State health officers for the week ended Oct. 19, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough			Week ended Oct. 19, 1946							
	Week ended—		Median 1941–45	Dysentery			Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
	Oct. 19, 1946	Oct. 20, 1945		Amebic	Bacillary	Unspecified					
NEW ENGLAND											
Maine		28	12								
New Hampshire	1	7	7								
Vermont	6	10	19								2
Massachusetts	118	136	94		2						1
Rhode Island	18	15	15		1						1
Connecticut	25	46	46								3
MIDDLE ATLANTIC											
New York	126	263	263	9	16		1				13
New Jersey	99	151	134	1						2	2
Pennsylvania	118	198	198								5
EAST NORTH CENTRAL											
Ohio	60	77	143	1							3
Indiana	9	37	17	1			2				6
Illinois	78	79	105	2				1	1		7
Michigan [2]	217	111	212		2						1
Wisconsin	164	93	161				1				10
WEST NORTH CENTRAL											
Minnesota	7	6	41	1							2
Iowa	3	4	15								51
Missouri	7	2	13			1					2
North Dakota			3				1				
South Dakota		1	2								2
Nebraska	1	3	6								
Kansas	14	12	24								1
SOUTH ATLANTIC											
Delaware	6	3	2					1			
Maryland [2]	24	48	48								
District of Columbia	7	3	4								
Virginia	71	33	24			24					
West Virginia	22	6	14			25					1
North Carolina	34	40	57							1	
South Carolina	1	73	50	3	1					1	
Georgia	6	16	16							14	6
Florida	9	4	6			1				6	2
EAST SOUTH CENTRAL											
Kentucky	15	22	24								1
Tennessee	9	25	25	1					2	2	3
Alabama	2	9	16							9	2
Mississippi [2]										1	2
WEST SOUTH CENTRAL											
Arkansas	9	10	15	1	4				5	1	
Louisiana	7	1	2	1	1					7	
Oklahoma		5	5	1							2
Texas	93	84	97	10	122	23			1	16	25
MOUNTAIN											
Montana	4	1	14			1					
Idaho		4	4								
Wyoming	1		4								
Colorado	9	15	19								
New Mexico	5	1	6		5	5					
Arizona	41	11	7			25					
Utah [2]	6	5	18						1		
Nevada		12	5								
PACIFIC											
Washington	12	29	29			6					2
Oregon	8	14	14				1				
California	67	140	140	2	10		8			4	4
Total	1,539	1,893	2,329	34	164	111	14	2	10	64	155
Same week, 1945	1,893			45	291	164	21	5	4	110	89
Average, 1943–45	1,876			46	475	171	16	[4] 1	4	[4] 110	
42 weeks: 1946	80,438			[7] 1,958	[7] 13,503	5,469	529	[3] 546	[3] 761	2,888	[4] 4,235
1945	102,802			1,570	21,285	9,423	542	450	621	4,065	3,869
Average, 1943–45	111,781		[4] 147,130	1,600	18,039	7,838	560	[4] 441	589	[4] 3,479	

[2] Period ended earlier than Saturday.
[4] 5-year median, 1941–45.
[7] Correction: Texas, week ended June 29, dysentery, amebic, 46 (instead of 397), bacillary, 397 (instead of 46).
[3] Delayed report: Arkansas, July, 2 tularemia, 1 undulant fever, Rocky Mountain spotted fever March, included in cumulative total only.

Anthrax: New Jersey 1 case. *Psittacosis:* California 1 case.

WEEKLY REPORTS FROM CITIES[1]

City reports for week ended Oct. 12, 1946

This table lists the reports from 86 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the deseases included in the table.

Division, State and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	------	0	2	0	2	0	0	3
New Hampshire:												
Concord	0	0	------	0	------	0	0	0	0	0	0	------
Massachusetts:												
Boston	4	0	------	0	3	0	4	10	9	0	1	24
Fall River	0	0	------	0	------	0	0	0	1	0	0	------
Springfield	0	0	------	0	5	0	0	0	1	0	0	13
Worcester	0	0	------	0	------	0	10	5	2	0	0	17
Rhode Island:												
Providence	0	0	------	0	------	1	2	0	1	0	0	29
Connecticut:												
Bridgeport	0	0	------	0	------	0	1	0	0	0	0	2
Hartford	0	0	------	0	------	0	1	4	0	0	0	------
New Haven	0	0	------	0	3	1	0	0	3	0	0	2
MIDDLE ATLANTIC												
New York:												
Buffalo	3	0	------	0	------	0	1	0	3	0	0	15
New York	14	0	2	1	7	3	43	33	18	0	1	44
Rochester	0	0	------	0	1	0	0	4	6	0	0	------
Syracuse	0	0	------	0	------	1	1	3	6	0	0	7
New Jersey:												
Camden	0	0	------	0	------	0	0	0	0	0	0	------
Newark	0	0	------	0	3	0	3	0	7	0	0	21
Trenton	1	0	1	1	------	0	5	1	1	0	1	1
Pennsylvania:												
Philadelphia	1	0	1	0	1	1	13	3	13	0	0	23
Pittsburgh	0	0	1	2	22	1	11	4	12	0	0	1
Reading	0	0	------	0	------	0	2	0	1	0	0	4
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	1	0	------	0	2	1	2	1	9	0	0	3
Cleveland	1	0	1	1	16	1	4	5	14	0	0	8
Columbus	1	0	------	0	1	0	0	1	8	0	0	1
Indiana:												
Fort Wayne	0	0	------	0	------	0	3	0	0	0	0	2
Indianapolis	3	0	------	0	1	0	4	3	12	0	0	12
South Bend	0	0	------	0	1	0	0	1	3	0	0	------
Terre Haute	0	0	------	0	------	0	1	0	0	0	0	------
Illinois:												
Chicago	1	0	1	1	8	0	25	34	24	0	0	52
Springfield	0	0	------	0	1	0	2	1	0	0	0	1
Michigan:												
Detroit	0	0	1	1	5	1	8	20	21	0	0	77
Flint	0	0	------	0	------	0	4	0	0	0	0	3
Grand Rapids	0	0	------	0	1	0	1	4	3	0	0	11
Wisconsin:												
Kenosha	0	0	------	0	------	0	0	1	0	0	0	------
Milwaukee	0	0	------	0	2	0	3	7	9	0	0	32
Racine	0	0	------	0	------	0	1	6	1	0	0	------
Superior	1	0	------	0	------	0	0	2	0	0	0	------
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	1	0	0	5	1	0	0	1
Minneapolis	6	0	------	0	------	0	1	10	6	0	0	------
St. Paul	0	0	------	0	------	0	7	2	5	0	0	5
Missouri:												
Kansas City	0	0	------	0	------	0	3	13	5	0	0	3
St. Joseph	0	0	------	0	------	0	0	0	0	0	0	------
St. Louis	0	0	------	0	4	0	4	20	4	0	1	------

[1] In some instances the figures include nonresident cases.

City reports for week ended Oct. 13, 1946—Continued

Division, State, and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	0	0	------	0	-------	0	7	18	1	0	0	------
Kansas:												
Topeka	1	0	------	0	-------	0	0	1	0	0	0	------
Wichita	0	0	------	0	2	0	3	3	0	0	0	------
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	0	-------	0	0	0	2	0	0	2
Maryland:												
Baltimore	1	0	------	0	1	1	0	0	4	0	0	14
Cumberland	0	0	------	0	-------	0	0	0	0	0	0	------
Frederick	0	0	------	0	-------	0	0	0	0	0	0	------
District of Columbia:												
Washington	0	0	1	1	1	0	5	1	1	0	0	9
Virginia:												
Lynchburg	0	0	------	0	-------	0	2	0	0	0	0	------
Richmond	0	0	1	1	4	0	0	0	1	0	0	1
Roanoke	9	0	------	0	2	0	0	0	0	0	0	------
West Virginia:												
Charleston	0	0	------	0	-------	0	0	0	0	0	0	------
Wheeling	0	0	------	0	-------	0	1	1	0	0	0	------
North Carolina:												
Wilmington	1	0	------	0	2	0	2	0	0	0	0	------
Winston-Salem	0	0	------	0	7	0	4	0	2	0	0	5
South Carolina:												
Charleston	0	0	15	0	-------	0	2	0	3	0	0	------
Georgia:												
Atlanta	0	0	1	0	1	0	1	1	2	0	0	------
Brunswick	0	0	------	0	-------	0	1	0	1	0	0	------
Savannah	0	0	------	0	-------	0	0	0	1	0	0	------
Florida:												
Tampa	4	0	------	0	1	0	1	1	1	0	0	------
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	0	1	0	1	0	4	1	2	0	0	5
Nashville	0	0	------	0	-------	0	0	0	1	0	0	------
Alabama:												
Birmingham	1	0	------	0	-------	0	3	1	1	0	0	------
Mobile	2	0	------	0	-------	0	3	1	1	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	------	0	1	0	1	1	1	0	0	------
Louisiana:												
New Orleans	6	0	1	1	1	0	*2	3	0	0	1	*7
Shreveport	1	0	------	0	-------	0	4	1	0	0	0	------
Texas:												
Dallas	1	0	------	0	-------	0	2	1	1	0	0	4
Galveston	0	0	------	0	-------	0	3	0	0	0	0	------
Houston	0	0	------	0	-------	0	6	2	1	0	0	------
San Antonio	0	0	------	0	-------	0	7	0	0	0	0	------
MOUNTAIN												
Montana:												
Billings	0	0	------	0	-------	0	0	0	0	0	0	------
Great Falls	0	0	------	0	-------	0	0	2	1	0	0	------
Helena	0	0	------	0	-------	0	2	0	0	0	0	------
Missoula	0	0	------	0	-------	0	1	0	0	0	0	------
Colorado:												
Denver	1	0	4	0	4	1	8	8	3	0	1	10
Pueblo	0	0	------	0	-------	0	0	1	1	0	0	------
Utah:												
Salt Lake City	0	0	------	0	3	0	0	0	2	0	0	2

*Includes reports from V. D. Isolation and Charity Hospital; figures not used in computing rates.

City reports for week ended Oct. 19, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	1	0	------	0	2	0	2	1	1	0	0	------
Spokane	0	0	------	0	1	0	2	2	0	0	0	------
Tacoma	0	0	------	0	1	0	0	1	2	0	0	1
California:												
Los Angeles	3	0	------	0	7	2	0	17	22	0	0	8
Sacramento	1	0	------	0	------	0	0	3	2	0	1	------
San Francisco	1	0	------	0	2	0	3	2	8	0	0	2
Total	72	0	32	10	132	15	252	282	280	0	7	480
Corresponding week, 1945	76	------	18	7	239	------	252	------	386	0	14	522
Average, 1941–45	79	------	50	[3] 13	[3] 239	------	[3] 288	------	460	0	25	780

[3] 3-year average, 1943–45.
[3] 5-year median, 1941–45.

Dysentery, amebic.—Cases: New York 1; Chicago 2.
Dysentery, bacillary.—Cases: New York 3; Chicago 1; Detroit 1; Baltimore 2; San Antonio 2; Los Angeles 9.
Dysentery, unspecified.—Cases: Baltimore 1; San Antonio 4.
Rocky Mountain spotted fever.—Cases: New York 1.
Tularemia.—Cases: St. Louis 1.
Typhus fever, endemic.—Cases: New York 2; Newark 1; Philadelphia 1; Kansas City 2; Tampa 2; Little Rock 3; New Orleans* 14; Houston 2; Los Angeles 2.

*Includes reports from V. D. Isolation, and Charity Hospital.

Rates (annual basis) per 100,000 population, by geographic groups, for the 86 cities in the preceding table (estimated population, 1943, 34,288,600)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	10.5	0.0	0.0	0.0	29	5.3	52.5	49.9	50	0.0	2.6	236
Middle Atlantic	8.8	0.0	2.3	1.9	16	2.8	36.6	24.5	31	0.0	0.9	54
East North Central	4.9	0.0	1.8	1.8	23	1.8	35.3	52.3	63	0.0	0.0	123
West North Central	14.1	0.0	0.0	0.0	14	0.0	50.3	144.8	44	0.0	2.0	18
South Atlantic	24.9	0.0	29.8	3.3	31	1.7	31.5	6.6	30	0.0	0.0	51
East South Central	23.6	0.0	5.9	0.0	6	0.0	59.0	17.7	30	0.0	0.0	30
West South Central	23.0	0.0	2.9	2.9	6	0.0	93.0	23.0	9	0.0	2.9	16
Mountain	8.3	0.0	33.0	0.0	58	8.3	90.9	90.9	58	0.0	8.3	99
Pacific	9.5	0.0	0.0	0.0	21	3.2	11.1	41.1	55	0.0	1.6	17
Total	11.0	0.0	4.9	1.5	20	2.3	39.0	43.0	43	0.0	1.1	74

PLAGUE INFECTION IN EL DORADO, KERN, AND SAN BENITO COUNTIES, CALIF.

Plague infection has been reported proved in fleas from rodents in El Dorado, Kern, and San Benito Counties, Calif., as follows:

El Dorado County.—A pool of 18 fleas from 3 tamarack squirrels, *Sciurus douglasii albolimbatus*, shot at Eagle Falls Public Camp, El Dorado National Forest, Emerald Bay, Lake Tahoe, received at the laboratory September 19 and proved October 9, 1946.

Kern County.—A pool of 400 fleas from 45 ground squirrels, *C. beecheyi*, shot 1½ miles east and ½ mile north of Lebec, east side of Castair Lake, received at the laboratory September 17 and proved positive October 14, 1946.

San Benito County.—Pools of 397 fleas from 18 ground squirrels taken July 6, and 266 fleas from 18 ground squirrels taken July 1, from a ranch 5 miles east of Tres Pinos; pool of 200 fleas from 56 ground squirrels, taken July 2, 7 miles east and 3 miles north of Tres Pinos; pool of 1,200 fleas from 57 ground squirrels taken July 3, and a pool of 705 fleas from 73 ground squirrels, taken July 5, 7 miles east of Tres Pinos. All ground squirrels were of the same species, *C. beecheyi*.

TERRITORIES AND POSSESSIONS

Hawaii Territory

Plague (rodent).—Under date of October 15, 1946, plague infection was reported in tissue from a rat (*Rattus hawaiiensis*) trapped on March 13, 1946, in District 14B, Haakakai Gulch, Island of Maui, T. H.

* * *

DEATHS DURING WEEK ENDED OCT. 12, 1946

[From the Weekly Mortality Index, issued by the National Office of Vital Statistics]

	Week ended Oct. 12, 1946	Corresponding week, 1945
Data for 93 large cities of the United States:		
Total deaths	8,585	8,380
Average for 3 prior years	8,488	
Total deaths, first 41 weeks of year	371,107	366,622
Deaths under 1 year of age	743	591
Average for 3 prior years	635	
Deaths under 1 year of age, first 41 weeks of year	26,643	24,891
Data from industrial insurance companies:		
Policies in force	67,300,227	67,291,661
Number of death claims	11,206	9,008
Death claims per 1,000 policies in force, annual rate	8.7	7.0
Death claims per 1,000 policies, first 41 weeks of year, annual rate	9.6	10.1

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended September 28, 1946.—During the week ended September 28, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox			2	55	103	23	6	23	33	245
Diphtheria		5	1	24	4	5	3		2	44
Dysentery, bacillary									1	1
German measles		2			5			3	2	12
Influenza		7			42			2		51
Measles		36		114	50	27	24	36	9	296
Meningitis, meningococcus		1		2	1				2	6
Mumps		1		8	61	23	41	16	113	263
Poliomyelitis	1	5	10	95	25	4	1		1	142
Scarlet fever	1	1	8	34	45	13	1	5	6	114
Tuberculosis (all forms)		7	7	121	54	48	7	69	31	344
Typhoid and paratyphoid fever			1	11	5		2		2	21
Undulant fever					1					1
Venereal diseases:										
Gonorrhea	2	15	30	99	141	42	33	35	116	513
Syphilis		14	17	83	83	17	10	4	52	280
Other forms									5	5
Whooping cough		16		50	39	4	4			113

FINLAND

Notifiable diseases—August 1946.—During the month of August 1946, cases of certain notifiable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	12	Paratyphoid fever	413
Diphtheria	900	Poliomyelitis	31
Dysentery	39	Scarlet fever	116
Gonorrhea	2,031	Syphilis	503
Malaria	17	Typhoid fever	78

NORWAY

Notifiable diseases—June 1946.—During the month of June 1946, cases of certain notifiable diseases were reported in Norway as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	11	Mumps	166
Diphtheria	312	Paratyphoid fever	8
Dysentery, unspecified	10	Pneumonia (all forms)	1,287
Erysipelas	439	Poliomyelitis	22
Gastroenteritis	4,149	Rheumatic fever	188
Gonorrhea	934	Scabies	3,080
Hepatitis, epidemic	352	Scarlet fever	582
Impetigo contagiosa	2,846	Syphilis	168
Influenza	1,712	Tuberculosis (all forms)	458
Lymphogranuloma inguinale	2	Weil's disease	1
Malaria	3	Whooping cough	2,990
Measles	580		

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusuel incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during recent months. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Cholera

China.—Cholera has been reported in certain provinces of China as follows: Anhwei Province—August 11–20, 1946, 450 cases, 12 deaths, August 21–31, 1946, 243 cases, 3 deaths, September 1–10, 1946, 140 cases, 5 deaths; Kiangsu Province—Shanghai—September 11–20, 1946, 50 cases, 7 deaths, September 21–30, 1946, 25 cases, 5 deaths; Kwangtung Province—Canton—September 11–20, 1946, 17 cases, 4 deaths.

Manchuria—Kirin Province.—Cholera has been reported in Kirin Province, Manchuria, as follows: August 1–10, 1946, 1,159 cases, 652 deaths, August 11–20, 1946, 1,054 cases, 426 deaths, August 21–31, 1946, 61 cases, 12 deaths.

Typhus Fever

Guatemala.—For the month of August 1946, 95 cases of typhus fever with 16 deaths were reported in Guatemala. Departments reporting the highest incidence are: Solola, 58 cases, 6 deaths; Quezaltenango, 6 cases, 2 deaths; Huehuetenango, 5 cases, 4 deaths; Chimaltenango, 5 cases; Sacatepequez, 2 cases, 1 death.

Philippine Islands—Manila.—For the week ended September 21, 1946, 3 cases of murine typhus fever were reported in Manila, Philippine Islands.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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